AMENDMENTS TO THE CLAIMS

Claim 1 (withdrawn): A method of reducing the systemic release of radioactive decay intermediates upon administration of an alpha particle-emitting radionuclide to an individual, comprising the steps of:

incorporating said radionuclide into large liposomes, said liposomes having a diameter sufficient to retain at least a majority of said radioactive decay intermediates; and

administering said large liposomes to said individual, wherein retention within said large liposomes of said radioactive decay intermediates produced by said radionuclide reduces the systemic release thereof.

Claim 2 (withdrawn): The method of claim 1, further comprising:

entrapping said radionuclide within smaller liposomal vesicles prior to incorporating said radionuclide contained therein into the aqueous phase of said larger liposome.

Claim 3 (withdrawn): The method of claim 2, further comprising:

labeling said smaller liposomal vesicles with biotin.

Claim 4 (withdrawn): The method of claim 1, further comprising the step of:

coating outer membrane surfaces of said large liposomes with molecules which preferentially associate with a specific target cell thereby increasing specificity of said large liposomes to said target cell.

Claim 5 (withdrawn): The method of claim 4, wherein said target cell is a cancer cell, a virally infected cell, an autoimmune cell, or an inflammatory cell.

Claim 6 (withdrawn): The method of claim 4, wherein said molecules are antibodies, peptides, engineered molecules or fragments thereof.

Claim 7 (withdrawn): The method of claim 6, wherein at least some of said antibodies are Herceptin.

Claim 8 (withdrawn): The method of claim 1, further comprising the steps of:

preinjecting the individual with empty large liposomes; and

saturating the reticuloendothelial organs to reduce non-tumor specific spleen and liver uptake of said radionuclide upon adminstration thereof.

Claim 9 (withdrawn): The method of claim 1, wherein said large liposomes have a diameter of about 600 nm to about 1000 nm.

Claim 10 (withdrawn): The method of claim 1, wherein said large liposomes comprise molecules incorporated into outer membranes to stabilize said large liposomes.

Claim 11 (withdrawn): The method of claim 10, wherein said stabilizing molecules are polyethyleneglycol-linked lipids (PEG-lipids).

Claim 12 (withdrawn): The method of claim 10, wherein said stabilizing molecules further comprise an antibody, peptide, engineered molecule or fragment thereof attached thereto.

Claim 13 (withdrawn): The method of claim 1, wherein said large liposomes comprise a stabilizing agent incorporated therein or have an aqueous phase with a high pH thereby further facilitating retention of said radioactive decay intermediates.

Claim 14 (withdrawn): The method of claim 13, wherein said stabilizing agent is a phosphate buffer, insoluble metal binding polymer, resin beads, metal-binding molecules or halogen binding molecules.

Claim 15 (withdrawn): The method of claim 1, wherein said large liposomes comprise additional molecules, said molecules facilitating membrane fusion with target cells or facilitating endocytosis by target cells.

Claim 16 (withdrawn): The method of claim 1, wherein said alpha particle emitting radionuclide is incorporated into the aqueous phase as a chelation compound.

Claim 17 (withdrawn): The method of claim 1, wherein said alpha-particle-emitting radionuclide is 225Ac, 223Ra, 213Bi, or 211At.

Claim 18 (withdrawn): The method of claim 1, wherein said alpha particle-emitting radionuclide is a daughter of a beta particle-emitting radionuclide, wherein said beta particle-emitting radionuclide is incorporated within said large liposomes.

Claim 19 (withdrawn): The method of claim 18, wherein said beta particle-emitting radionuclide is 212Pb.

Claim 20 (currently amended): A method of targeting cells in an individual for liposomal delivery of an alpha particle-emitting radionuclide thereto with reduced systemic release of radioactive decay intermediates comprising the steps of:

entrapping passively said radionuclide within small liposomal vesicles;

incorporating said entrapped radionuclide into the aqueous phase of large liposomes, said liposomes having a diameter sufficient to retain at least a majority of the radioactive decay intermediates of said radionuclide, said liposome comprising:

polyethyleneglycol-linked lipids (PEG-lipids) on outer membranes thereof; and

a targeting agent attached to the PEG-lipids, said targeting agent specific to the cells; and

delivering said radionuclide to the cells whereby said targeting agents target the cells while retention within said large liposomes of said radioactive decay intermediates produced by said radionuclide reduces the systemic release thereof.

Claim 21 (original): The method of claim 20, further comprising:

labeling said smaller liposomal vesicles with biotin.

Claim 22 (original): The method of claim 20, further comprising the steps of:

preinjecting the individual with empty large liposomes; and

saturating the reticuloendothelial organs to reduce non-tumor specific spleen and liver uptake of said radionuclide upon delivery thereof.

Claim 23 (original): The method of claim 20, wherein said large liposomes have a diameter of about 600 nm to about 1000 nm.

Claim 24 (original): The method of claim 20, wherein said targeting agents are antibodies, peptides, engineered molecules or fragments thereof.

Claim 25 (original): The method of claim 24, wherein at least some of said antibodies are Herceptin.

Claim 26 (original): The method of claim 20, wherein said targeted cells are cancer cells, virally infected cells, autoimmune cells, or inflammatory cells.

Claim 27 (original): The method of claim 20, wherein said large liposomes further comprise a stabilizing agent incorporated therein or have an aqueous phase with a high pH thereby further facilitating retention of said radioactive decay intermediates.

Claim 28 (original): The method of claim 27, wherein said stabilizing agent is a phosphate buffer, insoluble metal binding polymer, resin beads, metal-binding molecules or halogen binding molecules.

Claim 29 (original): The method of claim 20, wherein said large liposomes further comprise additional molecules, said molecules facilitating membrane fusion with target cells or facilitating endocytosis by target cells.

Claim 30 (original): The method of claim 20, wherein said alpha particle emitting radionuclide is incorporated into the aqueous phase of said small liposomal vesicles as a chelation compound.

Claim 31 (original): The method of claim 20, wherein said alpha-particle-emitting radionuclide is ^{225}Ac, ^{223}Ra, ^{213}Bi, or ^{211}At.

Claim 32 (original): The method of claim 20, wherein said alpha particle-emitting radionuclide is a daughter of a beta particle-emitting radionuclide, wherein said beta particle-emitting radionuclide is entrapped within said small liposomal vesicles.

Claim 33 (original): The method of claim 32, wherein said beta particle-emitting radionuclide is ^{212}Pb.

Claim 34 (withdrawn): A method of targeting cancer cells expressing HER-2/neu protein in an individual for liposomal delivery of Ac-225 thereto with reduced systemic release of radioactive decay intermediates thereof comprising the steps of:

entrapping said Ac-225 within small liposomal vesicles;

incorporating said entrapped Ac-225 into the aqueous phase of large liposomes, said liposomes having a diameter sufficient to retain at least a majority of the radioactive decay intermediates of Ac-225, said liposome comprising:

polyethyleneglycol-linked lipids (PEG-lipids) incorporated into outer membranes thereof; and

Herceptin antibodies attached to the PEG-lipids; and

delivering said Ac-225 to the cancer cells whereby said Herceptin targets the HER-2/neu protein expressed on the cells while retention within said large liposomes of said radioactive decay intermediates produced by said radionuclide reduces the systemic release thereof.

Claim 35 (withdrawn): The method of claim 34, further comprising:

labeling said smaller liposomal vesicles with biotin.

Claim 36 (withdrawn): The method of claim 34, further comprising the steps of:

preinjecting the individual with empty large liposomes; and

saturating the reticuloendothelial organs to reduce non-tumor specific spleen and liver uptake of said radionuclide upon delivery thereof.

Claim 37 (withdrawn): The method of claim 34, wherein said large liposomes have a diameter of about 600 nm to about 1000 nm.

Claim 38 (withdrawn): The method of claim 34, wherein said cancer cells comprise an ovarian carcinoma.

Claim 39 (withdrawn): The method of claim 34, wherein said large liposomes further comprise a stabilizing agent incorporated therein or have an aqueous phase with a high pH thereby further facilitating retention of said radioactive decay intermediates.

Claim 40 (withdrawn): The method of claim 39, wherein said stabilizing agent is a phosphate buffer, insoluble metal binding polymer, resin beads, metal-binding molecules or halogen binding molecules.

Claim 41 (withdrawn): The method of claim 34, wherein said large liposomes further comprise additional molecules, said molecules facilitating membrane fusion with target cells or facilitating endocytosis by target cells.

Claim 42 (withdrawn): The method of claim 34, wherein said Ac-225 is chelated.

Claim 43 (withdrawn): An encapsulated alpha particle emitting radionuclide, comprising:

said alpha particle emitting radionuclide;

small liposome vesicles entrapping said alpha particle emitting radionuclide; and

a large liposome incorporating said small liposome vesicles, said large liposome having a diameter sufficient to retain at least a majority of radioactive decay intermediates, said alpha particle emitting radionuclide thereby encapsulated therein.

Claim 44 (withdrawn): The encapsulated radionuclide of claim 43, further comprising:

labeling said smaller liposomal vesicles with biotin.

Claim 45 (withdrawn): The encapsulated radionuclide of claim 43, wherein said alpha particle emitting radionuclide is 225Ac, 223Ra, 213Bi, 212Pb, or 211At.

Claim 46 (withdrawn): The encapsulated radionuclide of claim 39, wherein said alpha particle-emitting radionuclide is a daughter of a beta particle-emitting radionuclide, wherein said beta particle-emitting radionuclide is encapsulated.

Claim 47 (withdrawn): The encapsulated radionuclide of claim 46, wherein said beta particle-emitting radionuclide is 212Pb.

Claim 48 (withdrawn): The encapsulated radionuclide of claim 43, wherein said radionuclide associates with a membrane of said small liposome or is incorporated into the aqueous compartment of said small liposome as a chelation compound.

Claim 49 (withdrawn): The method of claim 43, wherein said large liposomes have a diameter of about 600 nm to about 1000 nm.

Claim 50 (withdrawn): The encapsulated radionuclide of claim 43, wherein said large liposomes further comprise molecules which preferentially associate with a target cell, said molecules coating outer membrane surfaces of said large liposomes.

Claim 51 (withdrawn): The encapsulated radionuclide of claim 50, wherein said molecules are antibodies, peptides, engineered molecules or fragments thereof.

Claim 52 (withdrawn): The encapsulated radionuclide of claim 51, wherein at least some of said antibodies are Herceptin.

Claim 53 (withdrawn): The encapsulated radionuclide of claim 50, wherein said target cell is a cancer cell, a virally infected cell, an autoimmune cell, or an inflammatory cell.

Claim 54 (withdrawn): The encapsulated radionuclide of claim 43, wherein said large liposomes further comprise molecules incorporated into outer membranes to stabilize said large liposomes.

Claim 55 (withdrawn): The method of claim 54, wherein said stabilizing molecules further comprise an antibody, peptide, engineered molecule or fragment thereof attached thereto.

Claim 56 (withdrawn): The encapsulated radionuclide of claim 54, wherein said stabilizing molecules are polyethyleneglycol-linked lipids (PEG-lipids).

Claim 57 (withdrawn): The encapsulated radionuclide of claim 43, wherein said large liposomes comprise a stabilizing agent incorporated therein or have an aqueous phase with a high pH.

Claim 58 (withdrawn): The encapsulated radionuclide of claim 57, wherein said stabilizing agent is a phosphate buffer, insoluble metal binding polymer, resin beads, metal-binding molecules or halogen binding molecules.

Claim 59 (withdrawn): The encapsulated radionuclide of claim 43, wherein said large liposomes comprise molecules facilitating membrane fusion with a target cell or facilitating endocytosis by a target cell.